REMARKS

Claims 1-65 are pending in this application. Of these claims, claims 1-3, 5, 12-25, 45-51 and 58-65 stand rejected under 35 USC §103(a) as being unpatentable over Luukanen et al. in view of Laufer, Chou et al. or Butler et al., and claims 4, 6-11, 26-44 and 52-57 stand rejected under 35 USC §103(a) as being unpatentable over Luukanen et al. and Laufer or Chou et al. and further in view of Arnone et al.

In view of the preceding amendments and the following remarks, these rejections are traversed, and reconsideration of this application is respectfully requested.

Applicant's claimed invention is a system and method for detecting and analyzing the molecular constituents of chemical and biological materials in a sample. The system and method employs a spectrometer for analyzing the molecular constituents in the sample based on molecular spectroscopic properties, i.e., the vibrational and rotational bands of the chemical make-up in the sample. In order to more particularly define Applicant's invention, each of the independent claims 1, 20, 26, 32, 38, 45, 52 and 58 have been amended above to specifically state that the detection device is a spectrometer and that the spectrometer generates an emissions spectrum of molecular constituents in the sample. Support for this can be found in paragraph 6 of the specification, and elsewhere.

Known systems for detecting and analyzing the molecular constituents of chemical and biological materials in a sample in the terahertz frequency band are generally based on absorption spectroscopy. Particularly, a light source is placed behind the sample and a spectrometer measures the absorption spectrum as the light passes through the sample. Contrary, Applicant's invention employs "emission"

spectroscopy. It is typically not possible to measure an emissions spectrum of a sample at the molecular level unless the sample is heated to an elevated temperature relative to the background, such as by using flame or a high temperature pyrolysis process. In Applicant's invention, a cold surface is positioned behind the sample so that the emissions spectrum of the sample can be separated from emissions spectrum of the cold background so that the sample does not need to be heated. In other words, the emissions spectrum of the cold background is less than the emissions spectrum of the sample allowing it to be detected.

U.S. Patent No. 6,242,740 issued to Luukanen et al. discloses an imaging system that images an object 114 using a detector matrix 108, such as a bolometer. The Luukanen et al. imaging system physically measures the object 114 to identify its physical properties, such as its size, shape, surface reflectivity, etc. (column 1, lines 18-30). However, what the Luukanen et al. imaging system does not do is detect the emissions spectrum of the object 114 being imaged to determine its molecular constituents. The Luukanen et al. detector matrix 108 is not a spectrometer that detects and analyzes the emissions from molecules in a sample, but is a bolometer that images the object being detected. A detailed discussion of the detector matrix 108 can be found in column 4, line 48 – column 5, line 27 of Luukanen et al. Because the Luukanen et al. imaging system can only detect a physical object of relatively large size, it cannot detect vapor, fine powder, fine liquid droplets and aerosols because of the lack of sufficient reflectivity. Therefore, the Luukanen et al. imaging system cannot determine the chemical nature or chemical composition of the object being imaged. On

the other hand, Applicant's invention can detect vapor, fine powders, fine liquid droplets and aerosols, and their chemical composition using emissions spectrum analysis.

Further, the cold body 111 in the Luukanen et al. imaging system is used for enhancing the contrast between the object being imaged and its background. This contrast provides better physical resolution for the object being imaged. In Applicant's claimed invention, the cold surface is used to allow measurements of the emissions spectrum of the sample by suppressing background emissions so that the sample does not need to be heated. This allows sensing and spectroscopic analysis of the molecular constituents of chemical and biological materials. Therefore, Applicant respectfully submits that Luukanen et al. does not teach using a cold background surface in emissions spectrum analysis.

U.S. Patent No. 6,853,452 issued to Laufer discloses a sensor for detecting the absorption or emissions spectrum of target chemical species. The Laufer sensor has particular application for the UV through IR regions of the spectrum and not the terahertz frequency band. In order to separate the absorption or emission spectrum of the target chemical species, the Laufer sensor employs a sample filter assembly 10, 44 and a reference filter assembly 14, 46 that receive the emissions from the sample. The filtered signals from the filter assemblies are detected by detectors 26, 60 and 28, 60, respectively. The sample and reference signals are then compared to eliminate or reduce common noise components, variations in source power and absorption by interfering species (column 12, lines 40-45). In order to detect the absorption or emissions spectrum of the chemical species, the target species must be warmer than

the surrounding background by using the sun or some other artificial light source (column 11, lines 24-36).

As discussed above, the present invention provides the contrast of the emissions spectrum relative to the background by providing a cold surface behind the sample being detected. Laufer does not use a cold surface for this purpose, but requires that the sample be warmer than its background, and then uses a reference filter to reduce noise, as discussed above.

Because Laufer does not teach or suggest using a cold surface for detecting and analyzing the emissions spectrum to detect molecular constituents of a sample, Applicant respectfully submits that Laufer cannot provide the teaching missing from Luukanen et al. to make Applicant's claimed invention obvious. Particularly, Luukanen et al. only teaches using a cold background as a contrast for imaging an object and Laufer only teaches heating a sample relative to the background to provide the emissions spectrum contrast. Therefore, Applicant respectfully submits that Luukanen et al. and Laufer cannot be combined to teach or suggest the combination of using a cold background for analyzing the emissions spectrum to detect molecular constituents in a sample.

U.S. Patent No. 6,531,701 issued to Chou et al. discloses a system for the remote detection and analysis of chemical agents in the air. Chou et al. uses a spectrometer to analyze the emissions spectrum of a sample, such as a cloud 28. However, Chou et al. uses a radiation source 12 to heat the cloud to increase its emissions spectrum relative to the cooler background. Chou et al. does not teach or suggest using a cold surface in the background of the sample being detected to analyze

the emissions spectrum from the sample as in Applicant's claimed invention. Therefore, Applicant respectfully submits that Chou et al. also fails to provide the teaching necessary to make Applicant's independent claims obvious.

U.S. Patent No. 6,885,965 issued to Butler et al. discloses a system for detecting constituents in a gaseous plume 103 using a spectrometer 101, where a background 105 relative to the plume 103 is significantly warmer. The analysis technique disclosed by Butler et al. compares a sample spectrum to a known temperature spectrum in order to determine a sample background. However, Butler et al. does not teach or suggest using a cold surface in the background of a sample being analyzed by molecular spectroscopy. Therefore, Applicant submits that Butler et al. also fails to provide the necessary teaching to make Applicant's claimed invention obvious.

U.S. Patent Publication No. 2004/0155665 to Arnone et al. discloses a terahertz generator 1 that radiates a sample 3, and a detector 5 that detects the amplitude and phase of the radiation emitted from the sample 3. However, Arnone et al. fails to teach or suggest a spectrometer for analyzing the molecular constituents of a sample in the terahertz frequency range, where a cold surface is used behind the sample to increase the emissions spectrum of the sample. Therefore, Applicant submits that Arnone et al. fails to provide the necessary teaching to make Applicant's claimed invention obvious.

In view of the preceding amendments and remarks, it is respectfully requested that the §103(a) rejections be withdrawn.

It is now believed that this application is in condition for allowance. If the Examiner believes that personal contact with Applicant's representative would expedite prosecution of this application, she is invited to call the undersigned at her convenience.

Respectfully submitted,

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Date: 10/3/05

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